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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/814,965	03/31/2004	Clifford Earl Shamblen	129955/11854 (21635-0122)	8707
31450	7590	11/15/2006	EXAMINER	
MCNEES WALLACE & NURICK LLC 100 PINE STREET P.O. BOX 1166 HARRISBURG, PA 17108-1166			MCNELIS, KATHLEEN A	
			ART UNIT	PAPER NUMBER
			1742	

DATE MAILED: 11/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/814,965

Applicant(s)

SHAMBLEN ET AL.

Examiner

Kathleen A. McNelis

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 31 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a). Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 3/31/2004.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

### Claims Status

Claims 1-26 are presented for examination.

### DETAILED ACTION

#### *Claim Rejections - 35 USC § 102*

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

#### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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Claim 1-3, 5-7, 11, 13, 15 and 18 are rejected under 35 U.S.C. 102(b) as anticipated Baum (U.S. Pat. No. 3,918,956).

With respect to claim 1, Baum discloses a method for the direct reduction of iron with coal tar pitch (abstract) wherein iron ore ( $\text{Fe}_2\text{O}_3$ ,  $\text{Fe}_3\text{O}_4$  and  $\text{FeO}$ ) is reduced to metallic iron without causing the ore to melt (col. 1 lines 32-50). The oxides are reduced with a reductant such as coal or oil (col. 1 lines 33-42), i.e. chemically reacted to produce metallic iron (col. 9 lines 25-33). The reduced iron ore is then melted into liquid iron or steel and cast into ingots, pigs or billets (col. 4 lines 26 –50).

With respect to claims 2, 3 and 6, Baum discloses that the method produces stainless steel, for example 18-8 (i.e. Fe-Ni-Cr alloy) by using Cr, Ni and Fe ores as charge material (col. 14 lines 23-37). With respect to claims 5 and 11 Baum discloses the addition of coal tar pitch, coal or oil in reduction and production of steel or stainless steel from the melt which are Fe-C alloys, therefore Baum discloses carbon as an additive constituent. With respect to claim 7, since Baum discloses that the reduction is of a solid ore, the reduction is solid-phase. With respect to claim 13, Baum discloses production of liquid iron (i.e. no additives) cast into ingots or billets (col. 4 lines 26 –50). With respect to claims 15 and 18, Baum discloses casting as an ingot or billet (col. 4 lines 26 –50).

Claims 1-3, 5-7, 11 and 13 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Nagata et al. (U.S. PG Pub. No. 2002/0005089).

With respect to claim 1, Nagata et al. discloses a method for manufacturing high purity Fe by reducing iron oxide to more than 90% Fe in a solid state, then melting (abstract, ¶ 0019 and claims 1 and 2). Although heat is used, carbon is required for reduction (¶ 0037) and therefore the

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mechanism is chemical reduction. Since Nagata et al. discloses reduction in a solid state, at least some reduction occurs without melting the initial metallic particle. The metallic article produced is high purity iron (abstract) or iron alloy, metallic nickel or alloys thereof (§ 0065). Nagata et al. discloses furnishing at least two metallic precursors, iron and nickel oxides (§ 0037). While Nagata et al. does not disclose that the melt is solidified, such would be the case since Nagata et al. discloses separation and discharge of the molten product from the furnace (§ 0061).

Alternatively, Nagata et al. does not disclose that the reduction is performed without melting or that the product is solidified. One of ordinary skill in the art would operate the process of Nagata et al. by reducing the oxides before melting, since Nagata et al. discloses that molten iron oxide and smelting reduction can damage the refractory, therefore 98% or more reduction before melting is preferred (§ 0057). Further, one of ordinary skill in the art would expect the iron to be solidified after discharge from the furnace or further refining.

With respect to claim 2, Nagata et al. discloses furnishing at least two nonmetallic precursors, including iron and nickel oxides (§ 0065), therefore the base metal and one other metallic element are added. With respect to claim 3, while Nagata et al. does not recite that a nickel-base, iron-base or iron-nickel base alloy is formed, such would be the case when iron oxide is at least partially substituted with nickel (§ 0065) in the disclosed process. Alternatively, one of ordinary skill in the art would expect the formation of an iron-nickel alloy when iron oxide is at least partially substituted by nickel and subjected to reduction and melting.

With respect to claims 5 and 11, Nagata et al. discloses adding a carbonaceous reducing agent (abstract), which is an additive, therefore the melt of iron-nickel is mixed with carbon. With respect to claim 6, Nagata et al. discloses furnishing at least two nonmetallic precursor compounds, including iron and nickel oxides (§ 0065). With respect to claim 7, Nagata et al.

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discloses solid state reduction (abstract). With respect to claim 13, Nagata et al. discloses production of high purity iron (i.e. without alloying element) as discussed above regarding claim 1. Alternatively, although Nagata et al. does not recite that the high purity iron is produced without the addition of a metallic alloying element, one of ordinary skill in the art would expect this to be the case, since alternative embodiments are disclosed (§ 0065) with alloying elements.

Claims 1 and 9 are rejected under 35 U.S.C. 103(a) as unpatentable over the ASM Handbook, Volume 7 (1998).

With respect to claim 1, the ASM Handbook discloses a method for producing nickel by hydrometallurgical processing wherein an ore containing nickel is leached with sulfuric acid, and treated for removal of iron and copper. Metallic nickel is produced by hydrogen reduction and is precipitated from solution as a powder (pp. 171-173). The ASM Handbook teaches that most nickel powder produced this way is compacted into briquettes for consumption as an alloying additive in the steel industry (p. 174), therefore one of ordinary skill in the art would expect that the nickel is subsequently melted to produce a metallic article. With respect to claim 9, the hydrogen is vapor phase (i.e. hydrogen gas) (pp. 172-173).

Claims 1-3, 5-7 and 11 are rejected under 35 U.S.C. 103(a) as unpatentable over Kundrat (U.S. Pat. No. 5,567,224).

With respect to claim 1, Kundrat discloses a method for reducing metal oxide including chromium ore, nickel ore and stainless steel flue dust with coal or coke in a rotary hearth furnace, producing a make a feed stock for a refining vessel when manufacturing alloyed iron, steel, or stainless steel (abstract). The metal oxides are partially reduced on a rotary furnace hearth by heating in the presence of carbon to at least about 1000 °C then discharged to a melting furnace or refining vessel (col. 4 lines 10-55). In example 2, Kundrat discloses reduction of a low sulfur

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nickel laterite ore (contains NiO and Fe<sub>2</sub>O<sub>3</sub>) with coal by heating to 1200 °C, producing reduced pellets, which are discharged into an iron bath in an EAF for production of steel such as AISI 304 (col. 10 lines 21-47). Kundrat teaches that when nickel laterite is used, the mixture is transferred to an EAF for melting and deslagging (col. 9 lines 16-25). While Kundrat does not recite that the reduction is without melting the initial metallic particles, such would be expected since 1200 °C is below the melting temperatures of Ni (about 1455 °C) and Fe (about 1538 °C). Although not recited in Kundrat, the reduction is chemical since coal or coke is required. Further, in order to use the ore as intended by Kundrat to provide valuable alloying metals for producing stainless steel (col. 3 lines 8-10), one of ordinary skill in the art would expect that the reduced ore would be melted in the subsequent process step (i.e. iron bath) and subsequently solidified to produce a usable product (i.e. 304 stainless steel).

With respect to claims 2, 3 and 6, Kundrat example 2 discloses non-metallic precursor compounds NiO and Fe<sub>2</sub>O<sub>3</sub> (col. 10 lines 21-47). With respect to claims 5 and 11, Kundrat discloses adding a carbonaceous reducing agent (abstract), which is an additive; therefore the melt of iron-nickel is mixed with carbon. With respect to claim 7, although not recited, Kundrat discloses solid-state reduction since the ore and coal/carbon are solid during the reduction reaction.

Claims 10, 15, 16, 18-20 and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagata et al. (U.S. PG Pub. No. 2002/0005089) or Kundrat (U.S. Pat. No. 5,567,224) as applied to claim 1 and further in view of Peras (U.S. Pat. No. 3,234,608).

Nagata et al. or Kundrat are applied as discussed above regarding claim 1.

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Nagata et al. or Kundrat do not disclose that a liquid alkali or alkaline earth metal is added (claims 10 and 25), that the melt is solidified as a cast article (claims 15 and 24), ingot or billet (claim 18 and 24) or melting and solidifying without contacting a ceramic material (claim 16).

With respect to claims 15, 18 and 24, Nagata et al. or Kundrat discloses chemically reducing without melting at least two nonmetallic precursor compounds together comprising one of nickel, cobalt, iron or alloy thereof and subsequently melting the reduced intermediate product as discussed above regarding claim 1.

Peras discloses a method of continuous casting direct reduced iron ores as consumable electrodes to remove contaminates including FeO resulting from incomplete reactions in the reduction processes, producing marketable forms such as billets (col. 1 line 1 – col. 2 line 17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the melting/refining method of Peras to melt the reduced iron and iron/nickel intermediate products of Nagata et al. or Kundrat to remove contaminates and producing marketable billets as taught by Peras.

With respect to claims 10 and 25, Peras discloses the addition of liquid material for the formation of slag which assists in the reduction of FeO (col. 2 lines 56-72) as taught by the equation  $\text{FeO} + \text{Ca} = \text{CaO} + \text{Fe}$  (col. 5 lines 1-5). These materials are selected from calcium oxide or fluorspar (i.e.  $\text{CaF}_2$ ) where Ca is an alkaline earth metal or sodium fluoride or silicate where Na is an alkali metal (col. 3 lines 1-17).

With respect to claim 16, Peras discloses melting in a water-cooled copper casting mold (col. 8 lines 6-14), therefore the melt does not contact a ceramic material.

With respect to claims 19 and 20, Peras discloses rolling into sheet plates in rolling mills (col. 7 lines 45-52), which is both mechanical working and post-processing after solidification.



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With respect to claim 26, Nagata et al. or Kundrat discloses at least two nonmetallic precursor compounds selected from the claimed Markush group as discussed above regarding claims 3 and 6.

Claims 1-4, 14, 17, 20, 21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ellis et al. (U.S. Pat. No. 3,886,637) in view of the ASM Handbook, Vol. 7 and de Waal et al. (U.S. Pat. No. 4,606,761) or Altenhoner et al. (U.S. Pat. No. 4,040,816).

Ellis et al. discloses a plasma deposited coating of heat-treatable TiC tool steel having a microstructure consisting of martensite, bainite and mixture thereof upon cooling (abstract). The coating is made from powders of TiC, balance steel-forming ingredients and applied by a plasma flame which melts the powders (col. 3 lines 10-42). The steel-forming ingredients (20 to 90% of the total composition) contain at least 50% iron (col. 5 lines 52-57), which is preferably carbonyl iron powder (col. 7 lines 40-54).

Ellis et al. does not recite that the iron is produced from a nonmetallic precursor by chemical reduction without melting as in instant claim 1.

The ASM Handbook, Vol. 7 pp. 112-114 teaches that carbonyl iron powder is produced by passing carbon monoxide over a reduced sponge iron at 170 to 200 °C to produce iron pentacarbonyl which is decomposed to form high purity iron. This processing step is without melting.

de Waal et al. discloses a method for producing sponge iron by reducing iron oxide at temperatures between 850 and 1000 °C (abstract) at lower energy utilization than conventional processes (col. 3 lines 45-60). One of ordinary skill in the art would expect that at this temperature the iron would be reduced without melting, since the melting temperature of iron is about 1538 °C.

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Altenhoner et al. discloses a method for producing sponge iron with gas at a temperature of about 1000 °C (abstract). Altenhoner et al. teaches that this process produces sponge iron that is essentially free from sulfur which improves the resulting steel quality without an additional processing step for sulfur removal (col. 1 lines 40-59). One of ordinary skill in the art would expect that at this temperature the iron would be reduced without melting, since the melting temperature of iron is about 1538 °C.

It would have been obvious one of ordinary skill in the art at the time the invention was made to use the process taught by the ASM Handbook to produce the iron for use in Ellis et al., since Ellis et al. discloses that pentacarbonyl iron is preferred. Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to produce sponge iron as taught by de Waal et al. or Altenhoner et al. as the precursor for Ellis et al. in view of the ASM Handbook to produce sponge iron with lower utility consumption as taught by de Waal et al. or essentially free from sulfur as taught by Altenhoner et al.

With respect to claims 2 and 3, de Waal et al. or Altenhoner et al. teaches that iron oxide is the precursor as discussed above regarding claim 1.

With respect to claim 4, Ellis et al. discloses that the microstructure is martensitic steel after solidification as discussed above regarding claim 1. With respect to claims 14 and 17, Ellis et al. discloses that Mo and Cr are added to the carbonyl iron (col. 7 lines 40-54). With respect to claims 20, 21 and 23, Ellis et al. teaches that the coating is solution-quenched during rapid cooling following the plasma spraying to form a soft martensitic microstructure, and is subsequently age hardened by heat treatment (col. 6 line 57 – col. 7 line 8).

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Claims 1-3, 6 and 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tellkamp et al. (1997) in view of Bienvenu et al. (U.S. Pat. No. 4,820,339) or the ASM Handbook.

Tellkamp et al. discloses the application of a nanocrystalline inconel 718 (i.e. Ni-Fe-Cr-Mo superalloy containing) coating by high velocity oxy-fuel (HVOF) spray (abstract) wherein the HVOF process melts at least some of the particles (p. 490). Tellkamp et al. discloses that 10  $\mu\text{m}$  commercially prepared powder by mechanical milling (p. 491).

Tellkamp et al. does not disclose that the powders were produced by reduction without melting as in instant claim 1.

Bienvenu et al. discloses a method for production of metal powders by reduction of metal salts in a fused bath (abstract) where the metal produced can be pure metal, mixtures of metals or an alloy (col. 1 lines 62-68) where the reduced metal can be Ni, Fe, Cr and Mo (col. 3 lines 8-10). The metals are produced from metal halides (col. 3 lines 1-10) reduced by a reducing metal, preferably calcium (col. 2 lines 6-21). The resulting metal is high purity and in a size range of 1 to 10  $\mu\text{m}$  (col. 5 lines 28-41).

The ASM Handbook teaches that nickel, iron, chromium and molybdenum powders reduced from their metal carbonyls in vapor phase produce high purity powders of uniform size and structure and of a size between 3 to 7  $\mu\text{m}$  (pp. 167-170).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to prepare the starting powder by fused salt electrolysis as taught by Bienvenu et al. or vapor phase reduction as taught by the ASM Handbook for the thermal spray application of Tellkamp et al., since Bienvenu et al. or the ASM Handbook discloses production of high purity powders of the elements in the size range desired by Tellkamp et al.

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With respect to claims 2, 3 and 6, Bienvenu et al. discloses Ni, Co, Cr, Mo and Fe based powders and the ASM Handbook teaches Ni, Fe, Cr and Mo produced from non-metallic precursors as discussed above.

With respect to claims 20-23, Tellkamp et al. discloses that Inconel 718 is a solid solution strengthened, age-hardened alloy (p. 490), therefore it would have been obvious to one of ordinary skill in the art to perform solution heat treatment and ageing to produce nothing more than the expected results.

Claims 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tellkamp et al. (1997) in view of Bienvenu et al. (U.S. Pat. No. 4,820,339) as applied to claim 1.

Tellkamp et al. in view of Bienvenu et al. is applied as discussed above regarding claim 1.

With respect to claim 8, Bienvenu et al. discloses fused salt electrolysis. With respect to claim 10, Bienvenu et al. discloses a mixture of Mg/Ca chlorides (col. 3 lines 21-34).

Claims 9 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tellkamp et al. (1997) in view of the ASM Handbook as applied to claim 1.

Tellkamp et al. in view of the ASM Handbook is applied as above regarding claim 1.

With respect to claim 9, the ASM Handbook discloses that the compounds are reduced from vapor phase Carbonyls (pp. 167-171).

With respect to claim 12, the ASM Handbook discloses that the rate of decomposition of the carbonyl (i.e. reduction of the metal compound) is a function of the partial pressures of the carbonyl and carbon monoxide (p. 169, cols. 1 and 2). The time required for reduction is therefore recognized in the art as a result-effective variable. Optimization of the partial pressures and resulting reaction rate would have been obvious to one of ordinary skill in the art (see M.P.E.P 2144.05, II, B).

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*Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kathleen A. McNelis whose telephone number is 571 272 3554. The examiner can normally be reached on M-F 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KAM  
10/09/2006



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